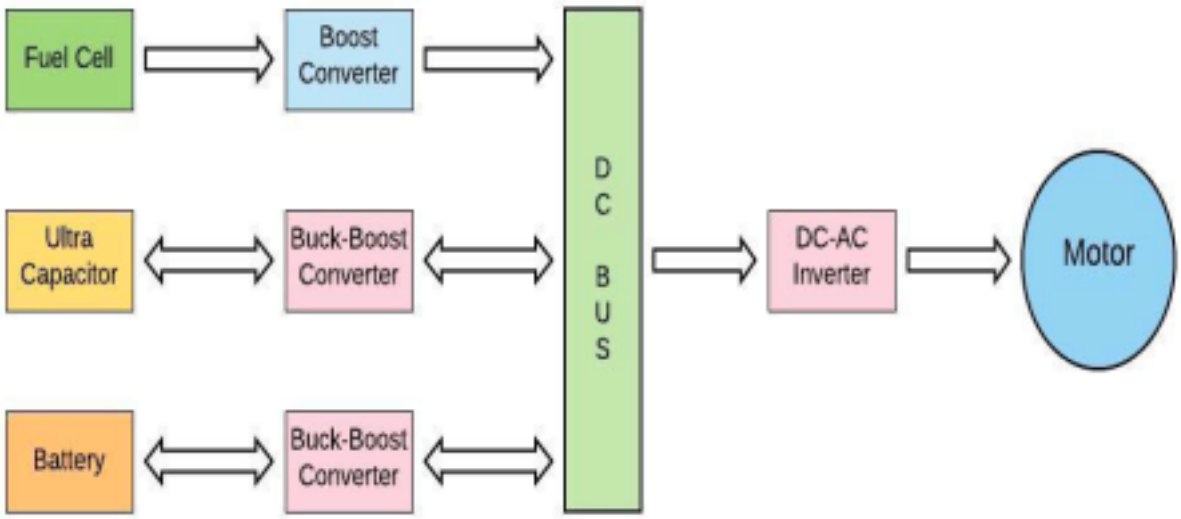
E-Pico Master's Thesis

High Order SMC for a unified model of a hybrid electric vehicle

In recent works on HEV, different controllers have been developed the energy sources or, separately, for the induction motor. Recent works have been tackled the approach of considering unified model of both essential components [1], [2], which includes a complete representation of electric systems of the HEV. This approach increases the performance of the vehicle and provides DC bus voltage regulation along with speed tracking when subjected to European extra urban drive cycle (EUDC).



Block diagram of an HEV

Goals

- To understand the unified model of the HEV
- To test in simulation the performance of recent robust controllers for a unified model of the HEV
- To design a High Order Sliding Model Controller (HOSMC) for the model
- To carry out simulations of the designed controller and compare with other approaches

[1] S. Ahmad, I. Ahmad, A. Ur Rahman and Y. Islam, Robust Integral Backstepping Control for Unified Model of Hybrid Electric Vehicles, IEEE Access, Vol. 8, 2020, DOI 10.1109/ACCESS.2020.2978258

[2] M. Islam, S. Ahmad, I. Ahmad, M. Liaquat, S. Abbas Khan, Adaptive nonlinear control of unified model of fuell cell, battery, ultracapacitor and induction motor-based hybrid electric vehicles, IEEE Access, Vol. 9, 2020, DOI 10.1109/ACCESS.2020.3072478

[3] Sanjai Massey, Modeling, simulation and control of hybrid electric vehicle drive while minimizing energy input requirements using optimized gear, M. Sc. Thesis, Michigan Technological University, 2016.

Requirements

You should have a good understanding of *Hybrid Electric Vehicles models, Vehicle dynamics control, Sliding Mode Control, MATLAB-SIMULINK*.

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